UNIVERSITY of York

This is a repository copy of *Zooming into the use of Zoom in higher education: A systematic literature review*.

White Rose Research Online URL for this paper:
https://eprints.whiterose.ac.uk/223384/

Version: Accepted Version

Proceedings Paper:
Pal, Anjan orcid.org/0000-0001-7203-7126 (2025) Zooming into the use of Zoom in higher education: A systematic literature review. In: International Conference on Ubiquitous Information Management and Communication. IEEE

https://doi.org/10.1109/IMCOM64595.2025.10857514

Reuse
This article is distributed under the terms of the Creative Commons Attribution (CC BY) licence. This licence allows you to distribute, remix, tweak, and build upon the work, even commercially, as long as you credit the authors for the original work. More information and the full terms of the licence here: https://creativecommons.org/licenses/

Takedown
If you consider content in White Rose Research Online to be in breach of UK law, please notify us by emailing eprints@whiterose.ac.uk including the URL of the record and the reason for the withdrawal request.

White Rose university consortium
Universities of Leeds, Sheffield & York

eprints@whiterose.ac.uk
https://eprints.whiterose.ac.uk/

Zooming into the use of Zoom in higher education: A systematic literature review

Anjan Pal
School for Business and Society
University of York
York, United Kingdom
anjan.pal@york.ac.uk

***Abstract*—The onset of the COVID-19 pandemic prompted a rapid adoption of video conferencing tools to support teaching and learning. Even though the pandemic has receded, these tools have cemented their place in the education landscape. This research aims to review the literature on the use of video-conferencing tools, specifically Zoom, in the context of higher education (HE). Articles were retrieved from two databases: Scopus and ERIC (Education Resources Information Center). The final sample included a total of 84 articles. The review uncovers six benefits of using Zoom in HE: Social presence, flexibility and accessibility, facilitating synchronous remote academic advising, conducting assessments, perceived usability, and inclusivity. It also identified seven challenges: Engagement issues, simulating hands-on experience, technical issues, privacy and security issues, familiarity issues, instructor difficulty, and Zoom fatigue. Several implications of these findings for future educational practices are discussed.**

Keywords—higher education, university education, online learning, e-learning, video conferencing tools, Zoom

I. Introduction

The onset of the COVID-19 pandemic in 2020 prompted a sudden disruption to the in-person learning environment in higher education (HE) institutions worldwide [1]. In response, most institutions had to adapt, innovate, and roll out changes quickly to the learning environment that shifted from the traditional format to a digital, distance learning-type format [2, 3]. The outcome was the rapid adoption of video conferencing tools such as Zoom to support teaching and learning [4, 5]. Even though the pandemic has receded, these tools have cemented their place in the HE landscape.

Regular use of these tools in HE has engendered new challenges for both instructors and students. For instructors, the key challenge during the pandemic was to recreate the in-person experience using such video conferencing tools. Even in the post-pandemic world, the substantial use of video conferencing necessitates instructors to acquire new competencies [6], particularly in terms of incorporating these technologies into traditional pedagogical practices [7] or assessments [8, 9]. For students, the key challenge during the pandemic had to do with the lack of community-building as well as acquiring hands-on or laboratory experiences [4, 10]. In the post-pandemic world, students' challenges often revolve around access to the internet and technical equipment [11, 12].

Therefore, this research reviews previous works on the use of video-conferencing tools in the context of HE. Specifically, it focuses on Zoom for two major reasons. First, Zoom became one of the most popular video conferencing tools to be used in HE in the aftermath of the virus outbreak [13, 14]. It witnessed a 458% rise in its customer base, many of whom were HE stakeholders [15]. The tool was widely used for e-learning purposes by universities in different countries including the UK, the US, China and India [16].

Second, although Zoom was not originally designed for educational purposes [1, 17, 18, 19], it has yet emerged as the predominant video conferencing tool in HE [14, 20]. The pandemic clearly turned out to be a gamechanger for the tool by widening its market to HE stakeholders. While this makes Zoom an interesting case study, deepening the understanding of its use in HE is not restricted to the tool but transferable to other video conferencing tools with similar functionalities.

This research conducts a review of the literature on the use of Zoom in the context of HE. Specifically, two research questions were addressed through a systematic literature review. These are:

RQ 1: What are the benefits of using Zoom as identified in the HE literature?

RQ 2: What are the challenges of using Zoom as identified in the HE literature?

The systematic literature review is a timely attempt followed by a review by [21] on Zoom utilization in HE. It differs from [21] in at least two ways. First, while Reference [21] reviewed the literature at a very nascent stage of the utilization of Zoom in HE and included only 32 articles from the ProQuest Education Database, this systematic review includes 84 articles from the two databases, including, Scopus and Education Resources Information Center (ERIC). Thus, it offers a more comprehensive review at a point in time when the field is more matured. Second, while [21] reviewed the literature on Zoom utilisation in HE, this systematic review seeks to gain insights on both benefits and challenges of using Zoom.

This paper has several implications. It is expected to synthesise the scholarly understanding of the use of Zoom for educational purposes both during and after the pandemic. This review can inform future educational practice associated with the use of Zoom in HE.

II. Methods

The systematic literature review was employed [22, 23]. It enables educators to better understand how Zoom can contribute to the field of HE going forward. The literature search was conducted in two phases. The first exploratory phase commenced in July 2023 with Scopus, the most comprehensive academic database [24]. For the sake of comprehensiveness, broad search terms such as "video conferencing" and "video conferencing tools" were used. Two observations arose: First, a wide range of articles were retrieved. These focused on the use of video conferencing for not only HE but also for everyday activities, socialising, and work-from-home settings. Second, the search retrieved many irrelevant articles when it was employed on full texts.

979-8-3315-0782-4/25/$31.00 ©2025 IEEE

However, the level of noise could be minimized by conducting the search on abstracts. These observations called for narrowing down the search terms. Therefore, for the main search, the following search query was used on abstracts: ("ZOOM") AND ("online learning" OR "e-learning" OR "higher education" OR "university education"). Search queries are often crafted using Boolean operators in this way [25].

The second and main phase of the literature search was carried out from August to December 2023. The search query ("ZOOM") AND ("online learning" OR "e-learning" OR "higher education" OR "university education") was applied on abstracts across two databases: Scopus and ERIC. Scopus was selected due its greater coverage than competitors such as the Web of Science [26]. In addition, ERIC was selected due to its extensive holdings of scholarly works within the field of education [27].

Three inclusion criteria were imposed. First, the search was restricted to articles published from 2020. This was guided by the research aim of understanding the use of Zoom in HE during and after the COVID-19 outbreak. Second, only articles published in journals were considered. All else being equal, journal articles are reviewed more rigorously than conference articles and book chapters. Third, only articles in English language were considered as it would not have been possible for the researcher to interpret articles in other languages.

The search yielded a total of 230 articles (57 articles in Scopus and 173 articles in ERIC). Of these, 159 articles that were available in full text were retrieved. Duplicate entries were observed as some of these articles appeared in both the databases. Such 26 duplicate articles were excluded from the pool of retrieved articles, and thereafter, the remaining 133 articles (159 - 26) were included for further screening. To ensure the selection of relevant articles, the remaining 133 articles were further accessed by reading the articles and thereby, resulting in an exclusion of 49 articles for different reasons such as (a) not focusing on Zoom, (b) not in Higher Education, (c) not an empirical work, (d) not relevant for the purpose of this review. Finally, a total of 84 articles (133 - 49) were used for the purpose of analysis (Fig. 1).

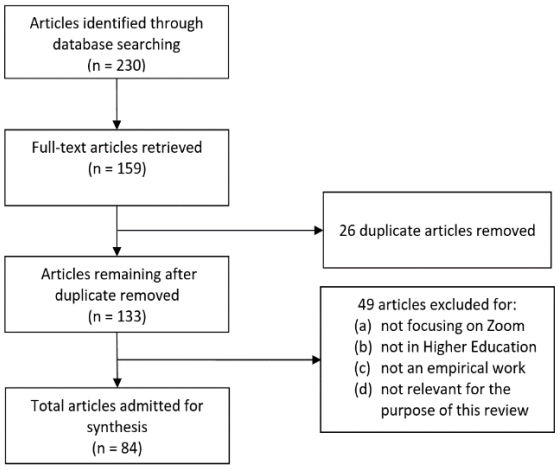

Fig. 1. Flowchart for article selection.

The analysis was done in two steps. First, the articles were inspected to record the following data points: (1) study objective, (2) research methods, (3) benefits of using Zoom, and (4) challenges of using Zoom in a spreadsheet. Second, the benefits and challenges of Zoom usage were thematically grouped. The idea was to come up with themes that are mutually exclusive. However, the analysis refrains from further focusing on summarizing the methods employed in these articles, as it is beyond the scope of the research questions proposed earlier.

III. Findings

The benefits of using Zoom in HE can be grouped into six major themes (Table I). These are illustrated below.

1) Social presence: Several articles in the sample highlighted that Zoom facilitates social presence in the learning process. This is vital as learning is inherently a social process [28]. Social presence on Zoom is achieved through interactive features such as breakout rooms, live polls, and the chat function. Articles such as [29] and [30] found that breakout rooms promote active learning through collaborative team activities. Live polls are useful to keep students engaged and feel the presentness of the others while looking at the collective responses. The utility of the chat function in enhancing students' learning experience has also been documented [31, 32]. It helps ensure that students do not feel left out, especially when they turn on their cameras [30, 33, 34]. The chat function not only allows students to react to one another's comments in real time but also enables sending instant messages to others. Nevertheless, [33] found that students felt more separated from their peers but more connected to their instructors in comparison to their pre-pandemic experiences. This could be attributed to factors like limited on-screen visual interaction or reluctance to turn on cameras [33].

2) Flexibility and accessibility: Zoom has been widely adopted as a synchronous alternative to face-to-face teaching, especially during periods of disruption caused by the pandemic. Synchronous learning encompasses real-time interaction between instructors and students, simulating a traditional classroom experience [32]. Many of the articles in the sample showed that Zoom enables real-time communication between instructors and students, allowing for live discussions, Q&A sessions, and immediate feedback [11, 16, 35], and thus, offers students a schedule and a sense of community, which is akin to the traditional learning experience [11, 34, 36].

Zoom provides various screen sharing options, allowing users to share their entire desktop, specific applications, or even a portion of their screen. Instructors can conduct live lectures through Zoom by sharing presentations, documents, and multimedia content [37]. The screen sharing feature facilitates dynamic and engaging presentations by both instructors and students, allowing for a seamless integration of visual aids into the virtual classroom [31, 38]. Instructors can demonstrate the use of specific software, tools, or applications relevant to the course curriculum by sharing their screens. This is particularly useful for disciplines that require hands-on training or involve the use of specialised software [31]. When it comes to STEM disciplines, Reference [39] was one of the few works that found Zoom to engage students even in practical work.

Many of the articles in the sample showed that Zoom recordings improve accessibility for students with different learning needs. While being recorded, students have access to live sessions at their convenience, accommodating diverse schedules, time zones, and learning paces. This ensures that students have the opportunity to engage with the course content at their own pace, thereby facilitating self-paced remote learning [10, 11, 37]. Students can also use recorded sessions for different future purposes such as revisions and exam preparation. They can review recorded sessions to reinforce their understanding of complex topics or revisit challenging discussions. Students who miss live classes due to personal commitments, emergencies, technical issues or poor internet connection can catch up by watching the recorded sessions [1].

Instructors can use recordings for make-up sessions or to provide alternative instruction for missed classes. They can use recorded sessions to provide personalised feedback on student presentations or contributions. Research also suggests that prerecorded presentation works better in asynchronous format [32]. Therefore, the recording functionality is useful for both students and instructors.

3) Facilitating synchronous remote academic advising: It refers to support services where an advisor gives support to student learning using remote communication technologies such as Zoom and Google Meets [40]. The discussion of academic advising could vary depending on meting objectives such as dissertation supervision, course selection, career direction, as well as pastoral supervision. Both advisors and students felt positively towards the use of synchronous communication technologies such as Zoom for remote academic advising [40]. Both perceive Zoom to be useful for remote academic advising in general [40, 41]. However, both believe that remote academic advising should not substitute for in-person advising in HE. Some newly admitted HE students prefer in-person academic advising to remote advising because of the greater human touch engendered by the former at the early stage of their HE journey [41].

4) Conducting assessments: Zoom can be used for conducting assessments. Articles such as [42] highlighted that Zoom monitoring could be useful to ensure academic integrity. It prevents students from cheating. Instructors can also conduct quizzes, polls, and other real-time assessments using Zoom, providing immediate feedback on student comprehension. According to Reference [43], Zoom turned out to be a preferred online assessment platform for students.

5) Perceived usability: Reference [44] finds that perceived usability of Zoom has a significant association with learning gain. The application is widely supported by various devices such as tablets and laptops, and thus achieve a high receptibility and usability [45]. Previous work found that perceived usefulness is a positive predictor of attitude and intention to use these remote learning technologies [46]. Hence, Zoom's perceived usability might have contributed to its widespread adoption.

6) Inclusivity: Several articles in the sample revealed that Zoom facilitates inclusive learning, providing opportunities for users who may have geographical constraints, work commitments, or health concerns [47, 48]. This offers convenience to both students and instructors. Instructors can conduct classes from anywhere. Likewise, students can attend the classes from anywhere. The use of zoom allows for a diverse range of guest speakers and lecturers across the globe for a richer and more inclusive teaching and learning experience compared with what would have been possible in traditional learning. As a by-product, various articles in the sample revealed that Zoom can help save time on commuting and provide universities with opportunities to cut down on their infrastructural expenses [37].

TABLE I. BENEFITS OF ZOOM USE IN HIGHER EDUCATION

Themes	**Articles**
1) Social presence	[4], [10], [13], [28], [29], [30], [31], [32], [33], [34], [36], [37], [46], [48], [50], [55], [56], [57], [58], [59], [60], [61], [62], [63], [64], [65], [90], [94], [97]
2) Flexibility and accessibility	[4], [10], [11], [13], [14], [18], [29], [31], [32], [34], [36], [37], [38], [41], [42], [45], [48], [49], [50], [56], [57], [58], [59], [61], [62], [64], [65], [66], [67], [68], [69], [79], [80], [82], [83], [84], [85], [86], [89], [92], [93], [94], [95], [96], [97], [98], [99], [100]
3) Facilitating synchronous remote academic advising	[40], [41]
4) Conducting assessments	[18], [42], [43], [65], [70], [83], [90], [96], [98]
5) Perceived usability	[44], [45], [46], [55], [62], [78]
6) Inclusivity	[37], [47], [48], [96]

The challenges of using Zoom in HE can be grouped into seven major themes (Table II). These are illustrated below.

1) Engagement issues: Several articles in the sample acknowledged that maintaining student engagement in Zoom classrooms is challenging [42, 47, 49]. Four main reasons were evident from the literature: First, students become particularly prone to distractions or multitasking during Zoom sessions [11, 49]. Factors such as overcrowded households and lack of a quiet space further hinder learning for students [9, 39].

Second, unwillingness to turn on cameras makes it difficult for instructors to assess whether learners are engaging in learning activities. With no option to study students' non-verbal cues, instructors have difficulty in adjusting their teaching approaches accordingly [11, 42].

Third, Reference [49] recognised some characteristics of Zoom as a problem when it came to online engagement: Students could not enter the communication spontaneously when they recognised the need for commenting. Instead, their comments were entered one after another. Students had to grapple with the task of determining the order of the discussants. Thus, substantial cognitive efforts had to be made on communication regulation and not on the actual content of the discussion.

Fourth, the absence of in-person experiences impedes students' willingness to engage [50]. Students felt that using Zoom prevents the development of emotional bonding and rapport with their instructors [20, 47]. Students experienced feelings of loneliness during remote learning [12].

2) Simulating hands-on experience: The transition to online learning significantly disrupted hands-on experiences in the pedagogical dimension [10, 51]. It is understandably

impossible for Zoom to simulate a real practical laboratory experience, which is vital especially for several natural sciences disciplines.

3) Technical issues: Several articles in the sample highlighted that students and instructors face challenges related to internet connectivity, leading to disruptions, audio/video lag, or dropped connections [11, 12, 20, 52]. Such technical issues impaired their overall learning experience [11, 39, 43]. Students were also worried about the stability of their technical equipment including computers, cameras and microphones [49]. Given that a Zoom session requires multiple technical equipment working seamlessly, both instructors and students found it less conducive compared with a face-to-face session [39, 47].

Clearly, lack of access to technology is a key factor affecting the use of Zoom [16, 20, 39]. Unequal access to the Internet impedes the success of rural students in their learning [45]. The New America Higher Ed Survey acknowledged that "having access to a stable, high-speed internet connection" was immensely challenging for them [53]. Thus, the use of Zoom can exacerbate the digital divide in HE.

4) Privacy and security issues: Concerns associated with privacy and security of Zoom meetings have been raised [42]. The default settings of Zoom are not sufficiently safe [52]. Instances of "Zoombombing" (unauthorized individuals joining meetings) have been reported. Articles reporting concerns around privacy and security were however far and few beyond 2022. Perhaps, Zoom took measures to nip the problem in the bud.

5) Familiarity issues: Both instructors and students experienced discomfort due to a lack of familiarity with Zoom [12, 20]. Instructors' difficulty in using Zoom posed a significant hurdle in online teaching and learning [12]. Both instructors and students may require training and time to become proficient with the features and functionalities of Zoom, potentially causing a steep learning curve [49].

6) Instructor difficulty: Although not mentioned widely, instructor difficulty emerged as one of the challenges in [20]. Instructors indicated that they required more time to prepare their lessons than what they would have taken for offline lessons. On a related note, online teaching made it particularly challenging for instructors to maintain a healthy work-life balance [39]. To aggravate the problem, instructors noted that the skills needed for teaching online was substantially different from those required for in-person teaching [39].

7) Zoom fatigue: Extended use of Zoom in HE contributes to "Zoom fatigue", a sense of exhaustion and burnout associated with prolonged virtual interactions. Continuous screen time and the need for sustained attention during online classes may negatively impact teaching and learning experiences [54]. Besides cognitive fatigue, physical fatigue is also a factor for having to look at screens for a prolonged period of time. Reference [54] identified four factors of zoom fatigue: Situational factors are often related to the number of video conferences scheduled in a day, their lengths, and the level of participation. Factors associated with individual trait pertain to a participant's personality, motivation, and self-awareness. Environmental factors consist of external elements such as surrounding distraction, background noise, and internet connectivity issues. Communication factors have to do with interaction-related issues including lack of nonverbal cues, interruptions, overlapping, and awkward silences.

TABLE II. CHALLENGES OF ZOOM USE IN HE

Themes	**Articles**
1) Engagement issues	[4], [9], [11], [12], [37], [41], [42], [49], [50], [54], [58], [64], [65], [69], [71], [72], [73], [85], [87], [90], [91], [97]
2) Simulating hands-on experience	[4], [10], [51], [58], [81]
3) Technical issues	[4], [11], [12], [20], [39], [41], [49], [50], [52], [57], [58], [64], [65], [69] [73], [74], [88], [90], [91], [92], [94], [96], [100]
4) Privacy and security issues	[4], [42], [52], [85]
5) Familiarity issues	[12], [40], [41], [49], [50], [57], [58], [65], [75], [91], [94]
6) Instructor difficulty	[20], [39], [91], [100]
7) Zoom fatigue	[54], [76], [77]

IV. DISCUSSION AND CONCLUSION

This paper has critically reviewed the literature on the use of Zoom in HE. It reveals six benefits: Social presence, flexibility and accessibility, facilitating synchronous remote academic advising, conducting assessments, perceived usability, and inclusivity. The review further identifies seven challenges: Engagement issues, simulating hands-on experience, technical issues, privacy and security issues, familiarity issues, instructor difficulty, and Zoom fatigue.

The findings of the review inform educational practices in at least eight ways. First, when Zoom has to be used in HE for synchronous teaching, instructors are recommended to actively use the platform's social presence features such as interactive whiteboards, polls, quizzes, and the chat function. Using a mix of these at different points can help promote active and collaborative learning.

Second, Zoom's recording functionality could be useful in terms of greater flexibility and accessibility in various HE scenarios. With the help of recording functionality, students have access to live sessions at their convenience, and thereby, facilitating self-paced learning. Students could be provided access to pre-recorded explanations of marking criteria. Instructors can reuse recorded content in future courses, creating a valuable repository of learning materials. New instructors or substitute instructors can leverage recorded sessions for continuity in course delivery. Zoom recordings could also be used as promotional materials in admissions events such as open days and visit days.

Third, drawing from the concept of remote academic advising, Zoom can be used to conduct supervision meetings regardless of any geographical constraints. Like in-person supervision meetings, Zoom meetings can be used to discuss progress, provide feedback, address concerns, and set goals for the future. By removing geographical barriers, Zoom allows research students to engage synchronously with experts in the field from any part of the world. In addition to the use of asynchronous communication technologies such as email and LMS in academic advising, the use of Zoom should be clarified further.

Fourth, Zoom can be used innovatively for assessment and feedback purposes. For instance, students can record Zoom presentations as a part of their assessments. In response,

instructors can use Zoom to offer recorded audio-visual feedback, which could be more engaging than written feedback. Depending on the nature of the task, Zoom can be a useful platform in conducting assessments.

Fifth, HE providers are recommended to better manage the scheduling of Zoom classes. Students should not be required to attend back-to-back sessions. The length of each session should be reasonable. Too many sessions within a day should also be avoided.

Sixth, HE providers should offer appropriate training to both instructors and students on how best to use Zoom. Teaching via Zoom requires new skills that may not be familiar to even experienced instructors. Therefore, there should be ample training opportunities for instructors to upskill themselves in terms of Zoom-based teaching. Furthermore, it should not be assumed that students are already aware of the best practice of using Zoom for learning. Students should receive training on how to maximize their learning experience in a Zoom-based environment. They could be encouraged to create a professional space in order to participate in Zoom lessons and to turn on their cameras. Guidance should also be provided in terms of how to practice self-care by taking sufficient breaks in between sessions.

Seventh, Zoom should be used to diversify access to guest speakers. Instructors now have the option to invite experts from any part of the world as guest speakers. This was unthought of in the pre-Zoom era and hence must be utilised.

Finally, HE providers should strive to address the digital divide. It is pertinent to ensure that learners have access to the necessary equipment (e.g., computers, webcams, microphones, stable internet connection) to participate in Zoom sessions. This may involve providing loan devices or financial assistance to students. Such efforts would be a step in the right direction in terms of raising the inclusivity of HE.

To conclude, I believe technology itself is neither "good" nor "evil" but what matters is how it is used. Conducting this systematic literature review has enabled me to reflect on how Zoom can be best used in HE. If it manages to make a few HE stakeholders deliberate on the topic, it would have achieved its goal.

REFERENCES

The asterisk (*) denotes the articles (84 articles) included in the systematic literature review.

[1] * K. Stecuła, and R. Wolniak, "Influence of COVID-19 pandemic on dissemination of innovative e-learning tools in higher education in Poland," Journal of Open Innovation: Technology, Market, and Complexity, vol. 8, no. 2, 89, 2022.

[2] L. Ghazi-Saidi, A. Criffield, C. L. Kracl, M. McKelvey, S. N. Obasi, & P. Vu, Moving from face-to-face to remote instruction in a higher education institution during a pandemic: Multiple case studies. International Journal of Technology in Education and Science, vol. 4 no. 4, pp. 370-383, 2020.

[3] G. Oliveira, J. Grenha Teixeira, A. Torres, and C. Morais, "An exploratory study on the emergency remote education experience of higher education students and teachers during the COVID-19 pandemic," British Journal of Educational Technology, vol. 52, no. 4, pp. 1357-1376, 2021.

[4] * S. K. Biber, S. Kucuk, I. Simsek, and T. Can, "The Instructors' Competencies and Experiences in Online Teaching," International Journal of Technology in Teaching and Learning, vol. 18, no. 2, pp. 85-100, 2022.

[5] M. A. Khan, "The impact of COVID-19 on UK higher education students: experiences, observations and suggestions for the way forward," Corporate Governance: The International Journal of Business in Society, vol. 21, no. 6, pp. 1172-1193, 2021.

[6] L. Starkey, "A review of research exploring teacher preparation for the digital age," Cambridge Journal of Education, vol. 50, no. 1, pp. 37-56, 2020.

[7] I. Y. Kabakci, & A. N. Çoklar, "Modeling preservice teachers' TPACK competencies based on ICT usage," Journal of Computer Assisted Learning, vol. 30, no. 4, pp. 363-376, 2014.

[8] G. B. Gudmundsdottir, and O. E. Hatlevik, "Newly qualified teachers' professional digital competence: Implications for teacher education," European Journal of Teacher Education, vol. 41, no. 1, pp. 214-231, 2017.

[9] * K. Linden, and P. Gonzalez, "Zoom invigilated exams: A protocol for rapid adoption to remote examinations," British Journal of Educational Technology, vol. 52, no. 4, pp. 1323-1337, 2021.

[10] * J. Dorovolomo, P. Rodie, B. Fito'o, and L. Z. Rafiq, "COVID-19 and online learning experiences of Solomon Islands students at the University of the South Pacific," Waikato Journal of Education, vol. 26, pp. 89-102, 2021.

[11] * L. D. Lapitan Jr, C. E. Tiangco, D. A. G. Sumalinog, N. S. Sabarillo, and J. M. Diaz, "An effective blended online teaching and learning strategy during the COVID-19 pandemic," Education for Chemical Engineers, vol. 35, pp. 116-131, 2021.

[12] * M. Meletiou-Mavrotheris, N. Eteokleous, and A. Stylianou-Georgiou, "Emergency remote learning in higher education in Cyprus during COVID-19 lockdown: A zoom-out view of challenges and opportunities for quality online learning," Education Sciences, vol. 12, no. 7, 477, 2022.

[13] * L. N. Fewella, "Impact of COVID-19 on distance learning practical design courses," International Journal of Technology and Design Education, pp. 1-24. 2023.

[14] * I. Simsek, S. Kucuk, S. K. Biber, and T. Can, "Online Learning Satisfaction in Higher Education amidst the COVID-19 Pandemic," Asian Journal of Distance Education, vol. 16, no. 1, pp. 247-261, 2021.

[15] L. Lambert, "Zoom's customer base soars 458% as it beats earnings estimates," [Online]. Fortune. Available at: https://fortune.com/2020/08/31/zoom-stock-zm-shares-q2-earnings-customer-base/ [Accessed 9 September 2023], 2020.

[16] * C. B. Mpungose, "Lecturers' reflections on use of Zoom video conferencing technology for e-learning at a South African university in the context of coronavirus," African Identities, vol. 21, no.(2), pp. 266-282, 2023.

[17] C. Flaherty, "Zoom boom," [Online]. Inside Higher Ed. Available at: https://www.insidehighered.com/news/2020/04/29/synchronous-instruction-hot-right-now-it-sustainable [Accessed 16 July 2023], 2020.

[18] * S. B. Khoza, "Exploring the migration to a digitalised curriculum at UKZN," Education Sciences, vol. 11, 2021.

[19] * A. E. E. Sobaih, A. Hasanein, and I. A. Elshaer, "Higher education in and after COVID-19: The impact of using social network applications for e-learning on students' academic performance," Sustainability, vol. 14, no. 9, pp. 5195, 2022.

[20] * M. Boyko, O. Turko, O. Dluhopolskyi, and H. Henseruk, "The Quality of Training Future Teachers during the COVID-19 Pandemic: A Case from TNPU," Education Sciences, vol. 11, 2021.

[21] L. R. Krome, "A review of Zoom utilization in higher education during the COVID-19 pandemic," Education, vol. 1(1-2020), pp. 11-26, 2020.

[22] Robson, S., Banerjee, S., & Kaur, A. (2022, January). Brand post popularity on social media: A systematic literature review. In 2022 16th International Conference on Ubiquitous Information Management and Communication (IMCOM) (pp. 1-6). IEEE.

[23] Majid, G. M., Tussyadiah, I., Kim, Y. R., & Pal, A. (2023). Intelligent automation for sustainable tourism: a systematic review. Journal of Sustainable Tourism, 31(11), 2421-2440.

[24] O. Chamorro-Atalaya, S. Olivares-Zegarra, L. Sobrino-Chunga, R. Guerrero-Carranza, A. Vargas-Diaz, M. Huarcaya-Godoy, ... & Y. Cruz-Telada, "Application of the Chatbot in University Education: A Bibliometric Analysis of Indexed Scientific Production in SCOPUS, 2013-2023," International Journal of Learning, Teaching and Educational Research, vol. 22 no. 7, pp. 281-304, 2023.

[25] Pal, A., & Chua, A. Y. (2016). Reviewing the landscape of research on the threats to the quality of user-generated content. *Proceedings of the Association for Information Science and Technology*, *53*(1), 1-9.

[26] B. Pham-Duc, T. Tran, T. P. T. Trinh, T. T. Nguyen, N. T. Nguyen, & H. T. T. Le, "A spike in the scientific output on social sciences in Vietnam for recent three years: Evidence from bibliometric analysis in Scopus database (2000-2019)," Journal of Information Science, vol. 48, no. 5, pp. 623-639, 2022.

[27] S. Banerjee, "To capture the research landscape of lecture capture in university education," Computers & education, vol. 160, 104032, 2021.

[28] * H. Collins, and D. Callaghan, "What a difference a Zoom makes: Intercultural interactions between host and international students," Journal of Comparative and International Higher Education, vol. 14, no. 2, pp. 96-111, 2022.

[29] * R. K. J. De Silva, and A. Peramunugamage, "Emergency remote CAD teaching using licensed software in apparel during the COVID-19 pandemic: A collaborative learning approach," Research in Learning Technology, vol. 31, 2023.

[30] * Y. J. Lee, R. Davis, and Y. Li, "Implementing synchronous online flipped learning for pre-service teachers during COVID-19," European Journal of Educational Research, vol. 11, no. 2, pp. 653-661, 2022.

[31] * C. Diaz-Nunez, G. Sanchez-Cochachin, Y. Ricra-Chauca, and L. Andrade-Arenas, "Impact of mobile applications for a lima university in pandemic," International Journal of Advanced Computer Science and Applications, vol. 12, no. 2, 2021.

[32] * J. Goob, K. Erdelt, J. F. Güth, and A. Liebermann, "Dental education during the pandemic: Cross-sectional evaluation of four different teaching concepts," Journal of Dental Education, vol. 85, no. 10, pp. 1574-1587, 2021.

[33] * K. L. Boardman, S. A. Vargas, J. L. Cotler, D. Burshteyn, and S. College, "Effects of Emergency Online Learning during COVID-19 Pandemic on Student Performance and Connectedness," *Information Systems Education Journal*, vol. 19, no. 4, pp. 23-36, 2021.

[34] * L. Kohnke, D. Zou, and R. Zhang, "Zoom supported emergency remote teaching and learning in teacher education: A case study from Hong Kong," Knowledge Management & E-Learning, vol. 15, no. 2, pp. 192-213, 2023.

[35] * R. Zhang, N. C. Bi, and T. Mercado, "Do zoom meetings really help? A comparative analysis of synchronous and asynchronous online learning during Covid‐19 pandemic," Journal of Computer Assisted Learning, vol. 39, no. 1, pp. 210-217, 2023.

[36] * D. Soliman, S. Costa, and M. Scardamalia, "Knowledge Building in Online Mode: Insights and Reflections", Education Sciences, vol. 11, 2021.

[37] * F. Shen, J. Roccosalvo, J. Zhang, Y. Tian, and Y. Yi, "Online technological STEM education project management," Education and Information Technologies, pp. 1-21, 2023.

[38] * M. Mursyidin, F. Parlindungan, and R. Rahmatillah, "Challenges in online learning during Covid-19 pandemic: Lessons learned from universities in Indonesia," TESOL International Journal, pp. 110-124, 2021.

[39] * A. Singh-Pillay, and J. Naidoo, "Context matters: Science, technology and mathematics education lecturers' reflections on online teaching and learning during the COVID-19 pandemic," Journal of Baltic Science Education, vol. 19, pp. 1125-1136, 2020.

[40] * C. X. Wang, M. Houdyshell, and M. Plescia, "Synchronous Communication Technology for Remote Academic Advising at a State University," Journal of Educational Research and Practice, vol. 12, no. 1, pp. 111-131, 2022.

[41] * C. X. Wang, and M. Houdyshell, "Remote academic advising using synchronous technology: Knowledge, experiences, and perceptions from students," NACADA Journal, vol. 41, no. 2, pp. 40-52, 2021.

[42] * C. Chen, S. Landa, A. Padilla, and J. Yur-Austin, "Learners' experience and needs in online environments: adopting agility in teaching," Journal of Research in Innovative Teaching & Learning, vol. 14, no. 1, pp. 18-31, 2021.

[43] * P. H. Wijayati, S. Retnantiti, S. P. Indriwardhani, M. Kharis, A. Novitasari, and T. C. Fitrisia, "Preferences of online learning assessment in higher education during the pandemic based on perspectives of students and lecturers," Journal of Higher Education Theory and Practice, vol. 22, no. 3, pp. 109-117, 2022.

[44] * P. Vlachogianni, and N. Tselios, "The relationship between perceived usability, personality traits and learning gain in an e-learning context," The International Journal of Information and Learning Technology, vol. 39, no. 1, pp. 70-81, 2022.

[45] * S. Aslam, SK Sonkar, and VJ Owan, "Changes in teaching and learning in higher education during Covid-19 lockdown: A study of LIS students in India," Library Philosophy and Practice (e-Journal). 2021.

[46] * M. A. Camilleri, and A. C. Camilleri, "The acceptance of learning management systems and video conferencing technologies: Lessons learned from COVID 19," Technology, Knowledge and Learning, vol. 27, no. 4, pp. 1311-1333, 2022.

[47] * D. Serhan, "Transitioning from Face-to-Face to Remote Learning: Students' Attitudes and Perceptions of Using Zoom during COVID-19 Pandemic," International Journal of Technology in Education and Science, vol. 4, no. 4, pp. 335-342, 2020.

[48] * M. Rathakrishnan, M. K. S. Singh, A. Raman, H. Dzakiria, and Y. B. Don, "COVID-19 Catastrophe: Internet Based Learning and Safety among Foundation Students of Universiti Utara Malaysia," Journal of Language and Linguistic Studies, vol. 17, no. 4, pp. 2142-2153, 2021.

[49] * P. Gradišek, and A. Polak, "Insights into learning and examination experience of higher education students during the Covid-19 pandemic", Journal of Contemporary Educational Studies, vol. 72, no. 138, pp. 286-307, 2021.

[50] * M. Kang, and A. Duong, "Student perceptions of first-time online learning during the COVID-19 pandemic in Vietnam," I.e.: Inquiry in Education, vol. 13, no. 1, Article 8, 2021.

[51] * N. Subashini, L. Udayanga, L. H. N. De Silva, J. C. Edirisinghe, and M. N. Nafla, "Undergraduate perceptions on transitioning into E-learning for continuation of higher education during the COVID pandemic in a developing country: a cross-sectional study from Sri Lanka," BMC Medical Education, vol. 22, no. 1, pp. 1-12, 2022.

[52] * M. I. Mohamed Riyath, U. L. Muhammed Rijah, and A. Rameez, "Students' attitudes on the use of Zoom in higher educational institutes of Sri Lanka," Asian Association of Open Universities Journal, vol. 17, no. 1, pp. 37-52, 2022.

[53] Global Strategy Group. (2020). New America higher ed survey. http://thirdway.imgix.net/New-America-and-Third-Way-Higher Ed-Student-Polling-Data.pdf

[54] * C. K. Massner, "Who's Zooming Who: A Case Study of Videoconferencing's Effects on Faculty and Students," International Journal of Technology in Education and Science, vol. 6, no. 4, pp. 602-619, 2022.

[55] * L. Kohnke, and B. L. Moorhouse, "Adopting HyFlex in higher education in response to COVID-19: students' perspectives," Open Learning: The Journal of Open, Distance and e-Learning, vol. 36, no. 3, pp. 231-244, 2021.

[56] * S. Young, and M. A. Bruce, "Student and faculty satisfaction: Can distance course delivery measure up to face-to-face courses?," Educational Research: Theory and Practice, vol. 31, no. 3, pp. 36-48, 2020.

[57] * A. A. Yunusa, I. TemitayoSanusi, O. A. Dada, S. S. Oyelere, F. J. Agbo, G. Obaido, and K. Aruleba, "The Impact of the COVID-19 Pandemic on Higher Education in Nigeria: University Lecturers' Perspectives," International Journal of Education and Development Using Information and Communication Technology, vol. 17, no. 4, pp. 43-66, 2021.

[58] * D. Tauhidah, U. N. A. D. Jayanti, A. Rahmasiwi, R. Pamungkas, and A. Saifulloh, "Utilization of e-Learning platforms by lecturers during the COVID-19 pandemic in Indonesia," Journal of Biological Education Indonesia, vol. 7, no. 3, pp. 198-207, 2021.

[59] * C. McComb, N. Leonard, M. Letts, A. Ruopp, C. Todd, G.-M. Yang, and K. Zaszlavik, "Zooming Support: Stories of How a Pandemic and SAMR Improved Preservice Art Education Instruction," Art Education, vol. 75, no. 1, pp. 42-48, 2022.

[60] * A. Nurkhin, J. T. B. Santoso, S. Y. Baswara, and C. W. Wolor, "Applying peer tutor learning and interactive case methods in online learning: Its effect on student activities and learning outcomes," International Journal of Educational Methodology, vol. 8, no. 3, pp. 551-565, 2022.

[61] * S. P. Karunanayaka, "Blending innovative pedagogy and technology for capacity development of educators during the pandemic," Journal of Learning for Development, vol. 10, no. 1, pp. 24-37, 2023.

[62] * I. Listiqowati, and I. N. Ruja, "The impact of project-based flipped classroom (PjBFC) on critical thinking skills," International Journal of Instruction, vol. 15, no. 3, pp. 853-868, 2022.

[63] * A. Boonmoh, T. Jumpakate, S. Saengmanee, and T. Rungkaew, "Integration of Technology during the COVID-19 Pandemic: Experience, Challenges and Needs of Thai EFL Teachers," REFLections, vol. 29, no. 2, pp. 251-277, 2022.

[64] * G. Gunawan, M. Kristiawan, E. Risdianto, and R. E. Monicha, Application of the Zoom meeting application in online learning during the pandemic. Education Quarterly Reviews, vol. 4, no. 2, pp. 26-32, 2021.

[65] * B. Souheyla, "Zoom sessions in distant learning: Algerian EFL students' perceptions and attitudes," Arab World English Journal, pp. 264-280, 2021.

[66] * R. Westerlund, O. Chugai, S. Petrenko, and I. Zuyenok, "Teaching and learning English at higher educational institutions in Ukraine through pandemics and wartime," Advanced Education, vol. 22, pp. 12-26, 2023.

[67] * I. Makruf, A. A. Rifa'i, and Y. Triana, "Moodle-Based Online Learning Management in Higher Education," International Journal of Instruction, vol. 15, no. 1, pp. 135-152, 2022.

[68] * D. M. A. Baker, R. Unni, S. Kerr-Sims, and G. Marquis, "Understanding Factors That Influence Attitude and Preference for Hybrid Course Formats", E-Journal of Business Education and Scholarship of Teaching, vol. 14, no. 1, pp. 174-188, 2020.

[69] * S. Elashhab, "Attitudes and Perspectives of Saudi Female Medical Students towards Online EFL Education under COVID-19 Circumstance", Arab World English Journal, pp. 104-119, 2022.

[70] * N. Ghounane, "Moodle or social networks: What alternative refuge is appropriate to Algerian EFL students to learn during COVID-19 pandemic," Arab World English Journal, vol. 11, no. 3, pp. 21-41, 2020.

[71] * M. C. Maphalala, N. P. Khumalo, and N. P. Khumalo, "Student teachers' experiences of the emergency transition to online learning during the Covid-19 lockdown at a South African university," Perspectives in Education, vol. 39, no. 3, pp. 30-43. 2021.

[72] * M. C. Maphalala, R. G. Mkhasibe, and D. W. Mncube, "Online Learning as a Catalyst for Self-Directed Learning in Universities during the COVID-19 Pandemic," Research in Social Sciences and Technology, vol. 6, no. 2, pp. 233-248, 2021.

[73] * J. Demuyakor, "COVID-19 pandemic and higher education: Leveraging on digital technologies and mobile applications for online learning in Ghana," Shanlax International Journal of Education, vol. 9, no. 3, pp. 26-38, 2021.

[74] * I. Irawaty, A. H. Momo, S. Sulfa, S. Salimin, N. Nerlin, and S. Y. Mustar, "Students' Perspective on Online Learning during the COVID-19 Pandemic", Journal of Education and Learning (EduLearn), vol. 16, no. 3, pp. 375-383, 2022.

[75] * Zulherman, Nuryana, Z., A. Pangarso, and F. M. Zain, "Factor of Zoom cloud meetings: Technology adoption in the pandemic of COVID-19," International Journal of Evaluation and Research in Education, vol. 10, no. 3, pp. 816-825, 2021.

[76] * E. A. Wood, S. L. Collins, M. Hechavarria, S. Foti, and G. Hack, "The shortfalls of online learning catalyzed by COVID-19: Pre-health students' perspective," Pedagogical Research, vol. 7, no. 3, em0128, 2022.

[77] * S. Veerasamy, and S. Goswami, "Is online learning better than offline learning?," International Journal of Education and Development Using Information and Communication Technology, vol. 18, no. 2, pp. 177-190, 2022.

[78] * H. A. Alfadda, and H. S. Mahdi, "Measuring students' use of zoom application in language course based on the technology acceptance model (TAM)," Journal of Psycholinguistic Research, vol. 50, no. 4, pp. 883-900, 2021.

[79] * M. H. Al Shammari, "Digital Platforms in the Emergency Remote Education: The Students' Preferences," Arab World English Journal, vol. 12, no. 4, pp. 19-36, 2021.

[80] * P. Dergham, F. N. Saudagar, C. C. Jones-Nazar, S. A. Hashim, Saleh, K., A. A. Mohammedhussain, ... and M. Madadin, "Medical students' perceptions towards online teaching during the COVID-19 pandemic: A cross-sectional study from Saudi Arabia," Advances in Medical Education and Practice, pp. 407-419, 2023.

[81] * A. V. Dyatlov, V. V. Kovalev, and A. V. Latsveeva, "Decline the quality of higher education in Russia: Negative consequences of moving to online education," International Journal of Cognitive Research in Science, Engineering and Education, vol. 10, no. 1, pp. 15-27, 2022.

[82] * A. Elalouf, A. Edelman, D. Sever, S. Cohen, R. Ovadia, O. Agami, and Y. Shayhet, "Students' perception and performance regarding structured query language through online and face-to-face learning," Frontiers in Education, vol. 7, 935997, 2022.

[83] * F. M. Guangul, A. H. Suhail, M. I. Khalit, and B. A. Khidhir, Challenges of remote assessment in higher education in the context of COVID-19: A case study of Middle East College," Educational Assessment, Evaluation and Accountability, vol. 32, pp. 519-535, 2020.

[84] * K. T. Hartert, "Combating the negative exam score impact of online human physiology laboratories via cognitive and structural strategies: A preliminary analysis," Bioscene: Journal of College Biology Teaching, vol. 47, no. 2, pp. 25-35, 2021.

[85] * G. Hitch, and S. Zaman, "COVID-19 pandemic experiences of students from BAME and White ethnic groups pursuing higher education in the UK: A qualitative comparative exploration," Frontiers in Psychiatry, vol. 13, 1078479, 2023.

[86] * Y. Ismaili, "Evaluation of students' attitude toward distance learning during the pandemic (Covid-19): A case study of ELTE university," On the Horizon, vol. 29, no. 1, pp. 17-30, 2021.

[87] * H. Ismail, A. Khelifi, and S. Harous, "A cognitive style based framework for usability evaluation of online lecturing platforms - A case study on Zoom and Teams," International Journal of Engineering Pedagogy, vol. 12, no. 1, 104-122, 2022.

[88] * I. E. Khuluqo, A. R. A. Ghani, and A. Fatayan, "Postgraduate students' perspective on supporting "Learning from Home" to solve the COVID-19 pandemic. International Journal of Evaluation and Research in Education, vol. 10, no. 2, pp. 615-623, 2021.

[89] * L. Mamedova, A. Rukovich, T. Likhouzova, and L. Vorona-Slivinskaya, "Online education of engineering students: Educational platforms and their influence on the level of academic performance," Education and Information Technologies, pp. 1-15, 2023.

[90] * J. Mananay, R. Alda, and M. S. D. Santos, "Glimpses of teaching in the new normal: Changes, challenges, and chances," International Journal of Learning, Teaching and Educational Research, vol. 21, no. 4, pp. 276-291, 2022.

[91] * E. Mansour, "Utilization of online learning platforms by LIS Arab faculty members during the coronavirus outbreak," Journal of Library & Information Services in Distance Learning, vol. 15, no. 1, pp. 18-40. 2021.

[92] * I. Ndungo, and C. Nazziwa, "Characterizing the Effectiveness of Video Recordings in Mathematics Instruction within Higher Education: Minimizing Direct Teacher-Student Interaction through Technological Modalities," Online Submission, vol. 49, no. 4, pp. 95-105, 2023.

[93] * I. Pavić, V. Mijušković, and L. Žager, "Which Digital Tools dominate Secondary and Higher Education in Economics: Google, Microsoft or Zoom?," Business Systems Research: International Journal of the Society for Advancing Innovation and Research in Economy, vol. 13, no. 2, pp. 117-134, 2022.

[94] * M. S. Quiamco, S. M. Abocado, and C. M. Toquero, "Zoom engagement of pre-service teachers during emergency remote classes," Asian Journal of Distance Education, vol. 17, no. 2, pp. 19-46, 2022.

[95] * A. W. Ritonga, M. Ritonga, T. Nurdianto, M. Kustati, and A. Lahmi, "E-Learning Process of "Maharah Qira'ah" in Higher Education during the COVID-19 Pandemic," International Journal of Higher Education, vol. 9, no. 6, pp. 227-235, 2020.

[96] * C. S. Santiago, M. L. P. Jr., Ulanday, Z. J. R. Centeno, M. C. D. Bayla, and J. S. Callanta, "Flexible Learning Adaptabilities in the New Normal: E-Learning Resources, Digital Meeting Platforms, Online Learning Systems and Learning Engagement," Asian Journal of Distance Education, vol. 16, no. 2, pp. 38-56, 2021.

[97] * L. M. Siciliano, "Is online theatre really theatre?: Teaching and researching during a pandemic," Teaching Artist Journal, vol. 19(1-2), pp. 27-35, 2021.

[98] * S. Silva, J. Fernandes, P. Peres, V. Lima, and C. Silva, "Teachers' perceptions of remote learning during the pandemic: A case study. Education Sciences, vol. 12, no. 10, 698, 2022.

[99] * A. Tandon, S. Brock, and Y. Joglekar, "Getting in synch: Understanding student perceptions of synchronous online instruction," Interdisciplinary Journal of Information, Knowledge & Management, vol. 17, pp. 625-643, 2022.

[100] * A. Zina, and S. Ahlem, "Perception of E-learning during the health crisis of COVID-19: Case of algerian university teachers," Journal of Information Technology Management, vol. 13, no. 2, pp. 154-172, 2021.